MANITOBA

ANNUAL REPORT

1981-82

Mineral Resources Division

The Department of Energy and Mines

Table of Contents

Highlights of the Year 1981/82 5

Mineral Resources Division 6

Economic & Policy Analysis 7

Mines Branch 8

- Mining Recording Section 8
- Aggregate Resources Section 8
- Geoscience Data Section 8
- Mining Engineering and Inspection Section 9

The Mining Industry 10

- Mineral Production 10
- Mining & Processing Operations 10
- Industrial Minerals/Structural Materials 15
- Mineral Exploration 15

Petroleum Branch 18

- Petroleum Production and Exploration 18
- Lease Sales 20
- Petroleum Royalties and Taxes 20
- Oil Pricing Agreement 20

Oil and Natural Gas Conservation Board 20

Geological Services Branch 21

- Precambrian Mapping 21
- Mineral Deposit Studies 21
- Stratigraphic/Industrial Minerals Program 21
- Geochronology 23
- Geophysical Surveys 23
- Analytical Laboratory 23
- Publications 23

Statistical Supplement 1981/82 24

Table 1 Comparison of Manitoba Mineral Production & Values 1980 and 1981 25
Table 2 A Comparison of the Value of Manitoba Metals, Industrial Minerals, Fuels and Total Mineral Production from 1971-1981 26
Table 3 Mineral Dispositions in Good Standing (At Year End) 27
Table 4 Disposition of Mineral Rights 1977 to 1981 Issued Each Year 28
Table 5 Revenue from Mining & Quarrying (To March 31) 29
Table 6 Manitoba Petroleum Statistics 1973-1981 (Calendar Year) 30
Table 7 Oil and Water Production Summary 31
Table 8 Crude Oil Sales — Transporters Disposition 1981 32
Table 9 List of Publications and Presentations 1981 — Geological Services Branch 33
Table 10 List of Preliminary Geological Maps — 1981 35

The Honourable Pearl McGonigal,

Lieutenant Governor of the Province of Manitoba.

May it please your Honour.

I have the honour of presenting to you the Annual Report of the Mineral Resources Division of the Department of Energy and Mines for the fiscal year ending March 31, 1982.

This report records the activities of the Mineral Resources Division and the performance of the mineral resources industry of the province during the year.

Wilson Parasiuk,

Minister.

The Honourable Wilson Parasiuk,
Minister of Energy and Mines.

Dear Sir:

I have the honour to present the Annual Report of the Mineral Resources Division of the Department of Energy and Mines for the fiscal year ended March 31, 1982. The report contains a descriptive and statistical record of activities and achievements in the mineral resource sector during the year.

Marc Eliesen

Marc Eliesen,

Deputy Minister.

Highlights of the Year

- The value of minerals, including fuels, produced in the province during 1981 was estimated at $679.8 million, down fro.n $820.6 million in 1980.

- A high level of exploration activity was maintained in the province during the year. Exploration expenditures during 1981 were estimated at $32 million compared with $28.5 million for 1980. Exploration for gold was at its highest level for more than a decade.

- A new mineral disposition regulation (Manitoba Regulation 147/81) came into force on July 11, 1981.

- Staking activity, reflected in the acreage of claims recorded during 1981 was the highest since 1970.

- Mine developments by Hudson Bay Mining and Smelting Co., Limited during the year included the commencement of work on sinking of the No. 4 shaft at the Stall Lake mine; completion of shaft sinking at the Rod mine; and completion of shaft sinking to 2150 feet, production from stope development and drifting on three levels at the Spruce Point mine.

- During the year development work at the new Trout Lake mine progressed on surface facilities and underground shops while the main declines were advanced to intersect the ore zones.

- At the Hudson Bay Mining and Smelting Co., Limited complex in Flin Flon, the purification circuit in the zinc leaching plant became operational in June 1981. A precipitator for the zinc roasters was near completion at year end and construction of the new zinc casting facility was commenced.

- On September 15, 1981, operations of Inco Metals Co. at Thompson were suspended due to a strike which lasted until December 16, 1981.

- In December, 1981, Sherritt Gordon Mines Limited announced a cut back at both the Fox and Ruttan mines involving approximately 373 positions.

- Rehabilitation of the San Antonio gold mine near Bissett continued during the year. San Antonio Joint Venture Ltd. installed a 550 tons per day mill at the mine and milling commenced in January 1982.

- Sherritt Gordon Mines Limited deepened the shaft at the Agassiz gold property to 835 feet during the year and a new level was established at 800 feet to permit underground drilling. Sherritt optioned this property from Comiesa Corporation in 1979.

- Oil and gas exploration was up significantly. A total of 62 wells were drilled during 1981 for a total of 61 011 metres, the highest since 1969. Forty-seven were completed as producers for a success ratio of 75%.

- Sales value of oil produced in the province during 1981 increased by $9.1 million over the previous year to $64.0 million, reflecting higher average wellhead prices.

- Two Crown oil and natural gas lease sales during 1981 netted $1.73 million in revenue for the government.

- Revenue from oil and gas royalties and taxes totalled $12.7 million in 1981.

- Agreement was reached between the province and the federal government on definitions and pricing for "conventional old oil" and "conventional new oil" produced in Manitoba, effective January 1, 1982.

- A new 1:1 000 000 Surficial Geological Map of Manitoba, 9 Preliminary Geological Maps and a Report of Field Activities were released on November 18 in conjuction with the Division's Annual Meeting with Industry in Winnipeg.

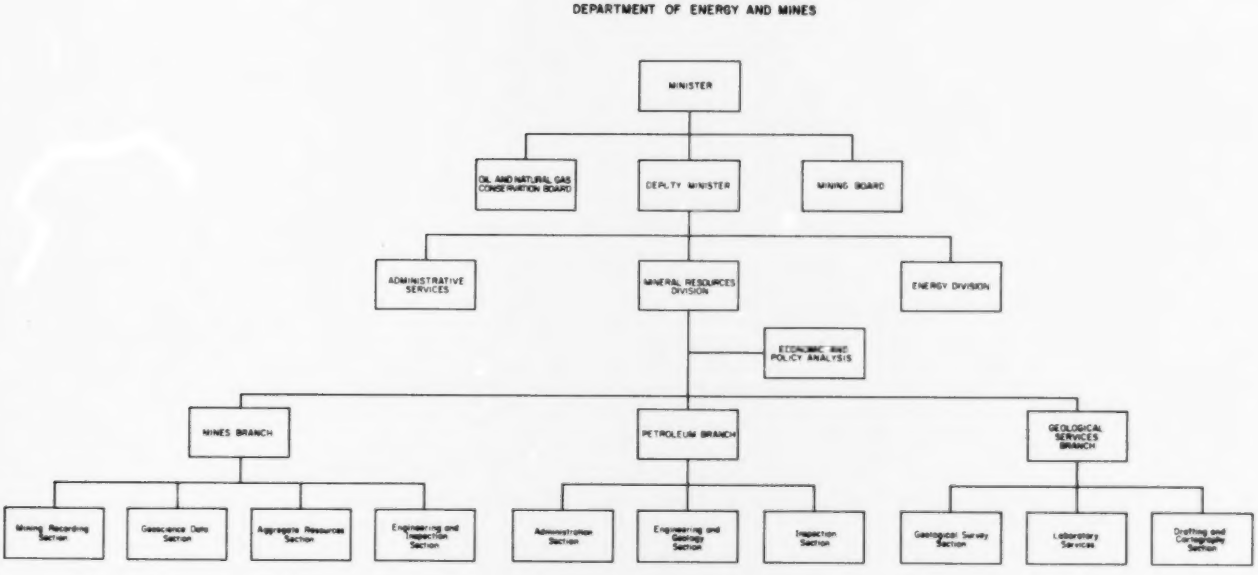
- Results of the 1980 aeromagnetic gradiometer survey of the Weldon Bay-Goose Lake region were released on June 30, 1981. The adjacent area to the east was flown in June, 1981 and the results will be released early in 1982.

Mineral Resources Division

Organization and Responsibilities

The Mineral Resources Division is responsible for the administration of the provincial Mines Act and Regulations governing the exploration, development and production of provincial mineral resources and the safety and health of employees in mining, smelting and refining operations; for the conduct of geological investigations directed towards providing a data base for mineral resource exploration, evaluation and development; for the provision of analysis supportive of mineral policy development; and for monitoring the effect of provincial mineral policy on the mining and petroleum industries of the province.

Provincial elections were held on November 17, 1981 and the New Democratic Party under the leadership of Premier Howard Pawley was elected to office. The Honourable Wilson Parasiuk was appointed Minister of Energy and Mines and Mr. Marc Eliesen, Deputy Minister.



Economic and Policy Analysis

The function of this section is to undertake analysis and evaluation of the economic and policy impact of provincial, national and international mineral resource developments on the provincial mineral industry, and to assist in policy development and implementation. Studies conducted by the section contribute to effective management of the provincial mineral resources and the maintenance of appropriate and effective mineral and mineral tax policies. Staffing currently stands at one Senior Advisor and one Economic Research Analyst.

The Section is responsible for the collection and analysis of provincial mining statistics. This function is carried out both by direct provincial surveys of mine and mill production, and through agreement with the Federal Department of Energy, Mines and Resources and Statistics Canada, by undertaking on behalf of these agencies surveys of Manitoba mining and exploration companies. A survey of exploration companies active in the province is conducted in December to provide an estimate of exploration expenditures in the current year and a forecast for the forthcoming year.

Staff of the Section, during the year, undertook evaluation and provided recommendations on a number of federal/provincial matters dealing with the mineral industry. They also participated in the work of the two special task forces set up by Federal and Provincial Ministers of Mines to deal with problems of Communities Solely Dependent on Mining and Taxation of Junior Mining in Canada.

Analysis and evaluation was undertaken for a number of potential mineral development projects in the province including potash, chromium, silica sand, and peat. A federal/provincial program for evaluation of the development potential of Manitoba's chromium occurrences was initiated during the year.

The Section continued to monitor negotiations at the United Nations Law of the Sea Conference, specifically those aspects dealing with seabed mining of manganese nodules for nickel and copper extraction. At the Eleventh Session of the Conference which commenced in New York on March 8, 1982, negotiations were concluded with a vote on the exisiting draft treaty. The results of the voting were 130 countries for the treaty, 4 countries (United States, Israel, Turkey and Venezuela) against, with 17 abstentions (including the United Kingdom, the Federal Republic of Germany, Italy, the Netherlands and Russia). Canada was to a large degree successful in its objective of securing provisions in the treaty that will provide for a phase-in of nickel from seabed mining in a manner that will not unduly disrupt its own land-based nickel operations. The Law of the Sea Treaty is expected to be ratified in December 1982. The treaty comes into force 12 months after 60 nations have signed and ratified it.

The publication 'A Guide to Legislation Affecting the Mineral Industry of Manitoba' was released during the year.

Mines Branch

The Mines Branch, through the activities of its component sections, is responsible for administration of matters relating to the operation of mines, including the health and safety of employees at mining, smelting and refining operations; the recording of mineral dispositions; the review of assessment reports and exploration activities; the rehabilitation of mining lands; aggregate resource inventory studies; and the implementation of provincial land use policy concerned with the conservation of aggregate resources.

Mining Recording Section

The Mining Recording Section maintains recording offices in Winnipeg and The Pas to administer regulations under The Mines Act governing the disposition of Crown mineral rights other than oil and natural gas. The regulations enable individuals and companies to acquire claims, permits and leases for the right to prospect, develop and mine Crown minerals. The Recorders and their staff process applications for these mineral dispositions; monitor and inspect the activities of the disposition holders; collect fees, rent, royalties and refundable performance deposits; maintain records; and generally deal with enquiries relating to these functions.

Total revenue from mining and quarrying in the 1981/82 fiscal year was $15,846,299 compared with $24,622,991 for 1980/81 (see Table 5).

There was a decrease in royalties from industrial minerals ($591,813 in 1981/82 compared with $608,592 in 1980/81) due to a slight decrease in activity in this sector.

During calendar year 1981, 1,319 mining claims were recorded for a total of 223 845 hectares (553,133 acres) compared with 201 979 hectares (499,102 acres) in 1980. Details of Crown mineral dispositions issued during the year are given in Table 4. Mineral dispositions in good standing at the end of the year are given in Table 3.

Manitoba Regulation 147/81 (The Mineral Disposition Regulation 1981) came into effect on July 11, 1981 replacing Manitoba Regulation 328/74.

Aggregate Resources Section

The Aggregate Resources Section undertakes detailed surficial geological mapping and aggregate resources inventories, and compiles quarry mineral management proposals based upon provincial land use policies. Resource inventory data and resource management proposals are supplied to Government and private sector users on demand.

Mapping of the Quaternary geology and the evaluation of sand and gravel deposits were undertaken by staff geologists in the Thompson and Churchill areas. Sand and gravel inventories were also initiated within the Rural Municipalities of Bifrost, Turtle Mountain, Franklin and the Local Government Districts of Stuartburn and Fisher.

An inventory of sand and gravel deposits and mapping of the Quaternary geology in the Western Interlake region were completed by Western Groundwater Consultants, consulting geologists, under contract to the Department. The inventory included a written report with seven accompanying maps.

In response to requests from Municipal Planning Districts, recommendations for the protection of quarry mineral resources were presented to six Municipal Planning Districts and two villages. The recommendations were supported by technical background reports and maps illustrating the proposed designated planning status of each economic deposit. Guidelines were provided for the rehabilitation of depleted pits and quarries. All proposed Crown land sales and land subdivisions were reviewed and, where necessary, recommendations made to minimize potential conflicts with mineral extraction.

A surficial geology map of Manitoba, with accompanying marginal notes, at a scale of 1:1 000 000 was released. Five preliminary surficial geology maps of the Thompson area and the Rural Municipality of Clanwilliam were also issued.

Geoscience Data Section

The Geoscience Data Section assesses reports of exploration work on mineral dispositions for compliance with the requirements of regulations under The Mines Act; distributes geological publications; maintains an inventory of mineral occurrences in the Province; monitors exploration activity in the Province; maintains computer files of exploration data; maintains published information on mining company activities; publishes geophysical reports on the various greenstone belts in the Province and administers the drill core collection and storage program.

During the fiscal year April 1, 1981 to March 31, 1982, 215 reports of exploration work were received and assessed by the Section; 65 reports were added to the non-confidential files; 775 files were reproduced for the private min-

ing sector and 443 open files were examined by mining industry personnel.

During the fiscal year, 1,496 orders for reports and maps were received. A total of 2,995 reports and maps were sold and an additional 2,653 complimentary copies were distributed.

The diamond drill core acquisition and storage program continued during the year. Since its inception in 1972, 310,000 feet (94 488 m) of core have been acquired and stored at The Pas (228,000', or 69 494 m), Lynn Lake (42,000', or 12 802 m),Thompson (28,000', or 8 534 m) and Winnipeg (12,000', or 3 658 m). The core is provided on a voluntary basis by mineral exploration companies and they in turn receive work credits for retrieval and transportation costs. The non-confidential core is available for examination by the private and public sectors and helps channel exploration dollars into more productive uses by eliminating the need to duplicate diamond drilling efforts.

Seven applications were received and approved under the Prospectors Assistance Program. Expenditures approved amounted to $27,944.66 of which the Department reimbursed 50% or $13,972.33. The program was terminated as of July 11, 1981 with the introduction of the new mineral disposition regulation, Manitoba Regulation 147/81.

The Section continued to update and prepare new index and compilation maps for reports of work filed as work commitments, to microfilm the reports and to maintain an inventory of mineral occurrences in the Province.

During the year, a report titled 'Summary and Evaluation of the Geophysical Data from the Open Assessment Files of the Lynn Lake Greenstone Belt' (MRD Open File Report OF81-5) by I.T. Hosain was released. The release of this report brings to completion the geophysical compilation of the following greenstone belts in the Province: Flin Flon-Snow Lake (MRD Open File Report OF78-2, Economic Geology Paper EP79-1), Bird River (MRD Open File Report OF78-4) and Lynn Lake (MRD Open File Reports OF80-1 and OF81-5).

Mining Engineering and Inspection Section

The Mining Engineering and Inspection Section administers regulations under The Mines Act governing the operation of mines and the rehabilitation of quarries, and enforces the Workplace Safety and Health Act at mines on behalf of the Department of Labour and Manpower. These functions are carried out by Mines Inspectors located in Winnipeg, Thompson, Flin Flon, Snow Lake, Leaf Rapids and Dauphin, and District Mining Engineers located in Winnipeg, Flin Flon and Thompson.

In 1981, 1213 inspections and investigations were conducted to assess compliance with The Mines Act and Regulations and the Workplace Safety and Health Act and to investigate reported dangerous occurrences. One prosecution was initiated. One hundred and twenty-five environmental surveys were conducted to assess in-plant environmental conditions.

The Section continued to monitor the adequacy of mine rescue facilities at mines and during the year 140 mine rescue personnel were provided with mine rescue training.

The Section also develops standards for the rehabilitation of quarries. Fourteen rehabilitation plans for commercial quarries were received and appraised during 1981 and 497 casual permits for removal of Crown quarry minerals were issued. Background information and recommendations relating to quarrying and rehabilitation were provided to three Municipal Planning Districts.

The Mining Industry

Mineral Production

The estimated value of mineral production including metals, industrial minerals and fuels, for 1981 was $679.8 million compared with $820.6 million for 1980, a decrease of approximately 17.2%. Lower unit prices for metals and lower production during the year were primarily responsible for this decrease (see Tables 1 and 2 in Statistical Supplement).

At $502.0 million (down 24.5%), metals accounted for more than 73% of the total value of Manitoba's 1981 mineral production. The value of the more significant metals produced during 1981 were: nickel $255.0 million (down 25.6%); copper $127.8 million (down 24.0%); zinc 47.2 million (up 13.0%); cobalt $13.9 million (down 50.2%); tantalum $23.5 million (up 7.8%); gold $22.1 million (down 39.6%), and silver $11.3 million (down 52.1%).

Mining and Processing Operations

Mining operations in Manitoba are currently located in the Flin Flon-Snow Lake area, the Lynn Lake-Leaf Rapids area, at Thompson, Bernic Lake and Bissett (see Map 1).

Base Metals

Hudson Bay Mining and Smelting Co., Limited operates a number of mines in the Flin Flon-Snow Lake area, concentrators at Flin Flon and Snow Lake and smelting (copper) and refining (zinc and cadmium) facilities at Flin Flon. Besides treating ores from the Company's own mines, concentrates of other operators are treated on a custom basis. These include Sherritt Gordon Mines Limited, Whitehorse Copper Mines Ltd., Pine Point Mines Limited, San Antonio Joint Venture Ltd. and some United States sources. The main products from the complex are anode copper, which is refined at Noranda's CCR Division in Montreal, Quebec, refined zinc, refined cadmium and lead concentrates which are shipped to Trail, B.C. for further processing. Approximately 1900 workers, including contractors, are employed at the Company's mines and processing facilities in Manitoba (500 in Saskatchewan). Total reserves at the Company's Flin Flon and Snow Lake mines were reported at the end of 1981 to be 16,143,300 tons grading 2.58% copper, 2.9% zinc, 0.034 oz/ton gold and 0.53 oz/ton silver.

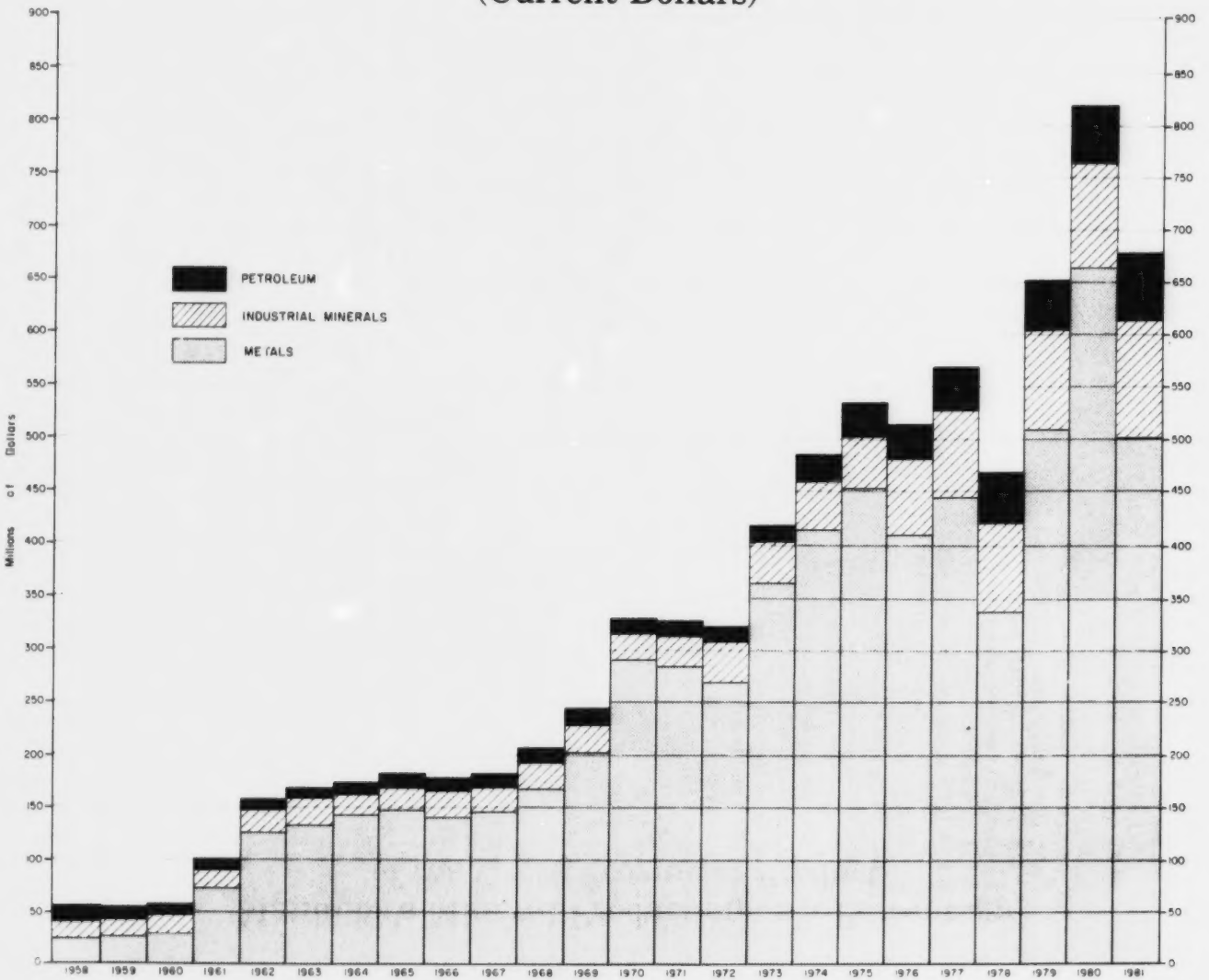
In the Snow Lake area, the Company operated five mines during the year and was developing an additional two. A 3800 ton per day concentrator at Stall Lake was commissioned in June 1979, and produces copper and zinc concentrates which are shipped to Flin Flon and lead concentrates which are shipped to Trail, B.C. for further processing. Normal production was maintained at the Anderson Lake, Chisel Lake, Stall Lake, Osborne Lake and Ghost Lake mines. At Stall Lake, work commenced on sinking No. 4 Shaft, an internal winze to develop the downward extension of the main ore zone. At the Rod mine, construction of surface plant buildings and equipment was completed and shaft sinking started in July 1981. Shaft sinking at the Spruce Point mine was completed to 2150 feet in July 1981. By the end of March 1982, there was production of 180 tons per day from stope development at the 154 m (505 foot) level while drifting continued at the 45 m (148 foot), 94 m (308 foot) and 214 m (1030 foot) levels.

In the Flin Flon area, the Flin Flon, Centennial, Westarm and White Lake mines were operated continuously during the year. Development of the Trout Lake mine near Flin Flon continued during the year under the terms of a joint venture agreement among Hudson Bay Mining and Smelting Co., Limited, Granges Expoloration AB, International Minerals Exploration Granges AB and Co., Outokumpu Oy and Manitoba Mineral Resources Ltd. Under the terms of this agreement Hudson Bay Mining and Smelting Co., Limited will operate the mine and treat the ore at the Flin Flon concentrator. In 1981, work progressed on surface facilities and underground shops while the main declines were advanced to intersect the ore zone.

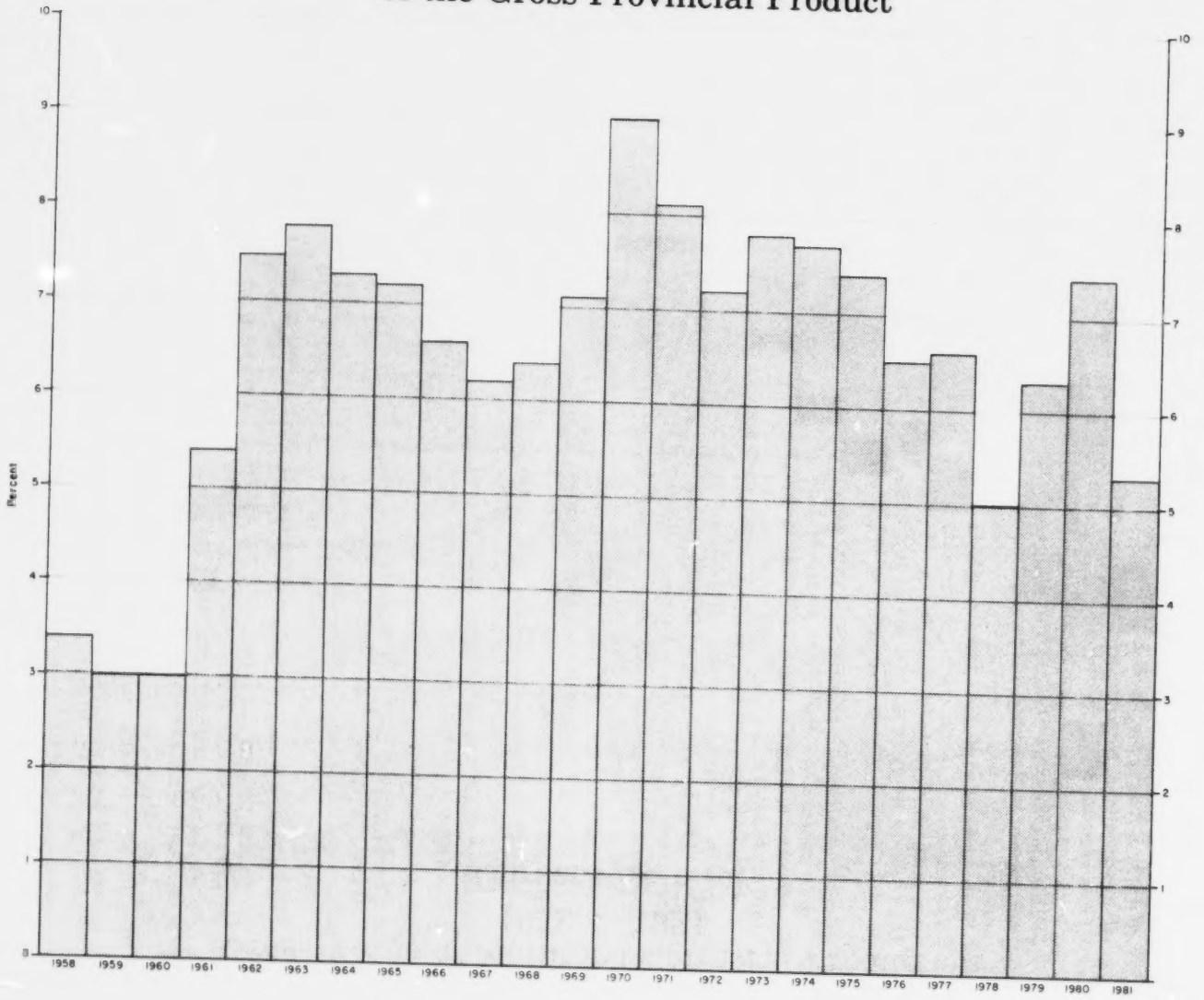
The purification circuit in the Company's zinc leaching plant at Flin Flon became operational in June. a precipitator for the zinc roasters was near completion at year end. Construction of a new zinc casting facility was initiated.

Inco Metals Company operates a number of mines and a concentrator, smelter and nickel refinery at Thompson. Ore production during 1981 came from the Thompson mine and the Pipe #2 Open Pit, while the Birchtree mine, Soab North mine, Soab South mine and Pipe Lake #1 mine remained closed during the year on a standby basis. The main product from this complex is electrolytic nickel. By-products include copper matte, cobalt oxide and pentlandite concentrate. Copper matte is shipped to the Company's refinery at Copper Cliff, Ontario, while commercial grade cobalt oxide is shipped to the Company's refinery at Clydach, Wales, where refined cobalt oxides and salts are produced. Pentlandite concentrates are sold as feed for Sherritt Gordon's nickel refinery at Fort Saskatchewan, Alberta.

Gross Value of Manitoba's Mineral Production
1958 — 1981
(Current Dollars)



Manitoba's Mineral Production as a Percentage of the Gross Provincial Product



Production at Thompson was curtailed in July during a scheduled shutdown of three weeks, and on September 15, 1981, operations were suspended due to a strike which lasted until December 16, 1981. At the end of 1981, 2300 persons were employed at the Company's Manitoba operations. Inco's ore reserves in the Thompson area are reported to be in excess of 72 million tons containing about 1.8 million tons of nickel, which, at the current rate of production, are expected to last well into the next century.

The Thompson mine is serviced by two shafts, the T-1 shaft to the 4340 level and the T-3 shaft to the 2600 level. The Pipe #2 Open Pit is 2000 feet long, 1600 feet wide and will have eighteen 40 foot benches to its ultimate depth of 720 feet. A 22-foot diameter concrete-lined shaft at this mine is completed to 3600 feet and during 1981, was again used primarily to service pumping facilities on the 1500 level to provide drainage for the open pit. The concentrator at Thompson processed approximately 13,000 tons per day when operating.

In October 1981, Inco announced the development of the first phase of its new Thompson Open Pit. This new open pit, to be located between the T-1 and T-3 shafts of the existing Thompson underground mine, will eventually replace the Pipe Open Pit which is scheduled to be depleted in early 1984. The first phase of the development, to cost $87 million, is expected to commence in 1982, with production scheduled to start in 1984. The second phase of development, expected to begin in 1988 with production by 1991,will cost approximately $77 million. (In July 1982, Inco announced the deferral of completion of the first phase for one year until 1986, due to continuing deterioration of revenues resulting from lower metal prices and deliveries.)

Sherritt Gordon Mines Limited operates two mines and concentrators in the Lynn Lake-Leaf Rapids area. A total of 1250 persons were employed at these operations during 1981, but in late December the Company announced a cut-back in production at both operations and a reduction in the work force of 373 positions.

The *Fox mine*, located 30 miles southwest of Lynn Lake, was brought into production in September 1970 with a capacity of 3000 tons per day. Production continued at this rate during 1981 but was reduced to 2500 tons per day in 1982. All ore is produced from blast-hole stopes with an adaptation of this method for pillar recovery. Ore below the 2000 level is developed by means of a ramp which was extended to the 2700 level during 1981. The concentrator at this mine produces copper and zinc concentrates which are trucked to the load-out facilities at Lynn Lake for rail shipment to Flin Flon where they are processed in the Hudson Bay Mining and Smelting metallurgical plant. Ore reserves at this mine, as of December 31, 1981, were reported as 2,608,000 tons averaging 1.94% copper and 1.59% zinc.

The *Ruttan mine*, located 75 miles southeast of Lynn Lake, commenced production in 1973 from an open pit. In 1974, development of the underground mine was initiated by driving a decline and conveyorway which now extends to the 1400 foot level. A service shaft was completed in 1980 to the 2240 foot level for the purpose of exploring the downward extension of the orebodies. Two exploration levels at 1800 and 2200 were completed in 1981 and diamond drilling was initiated.

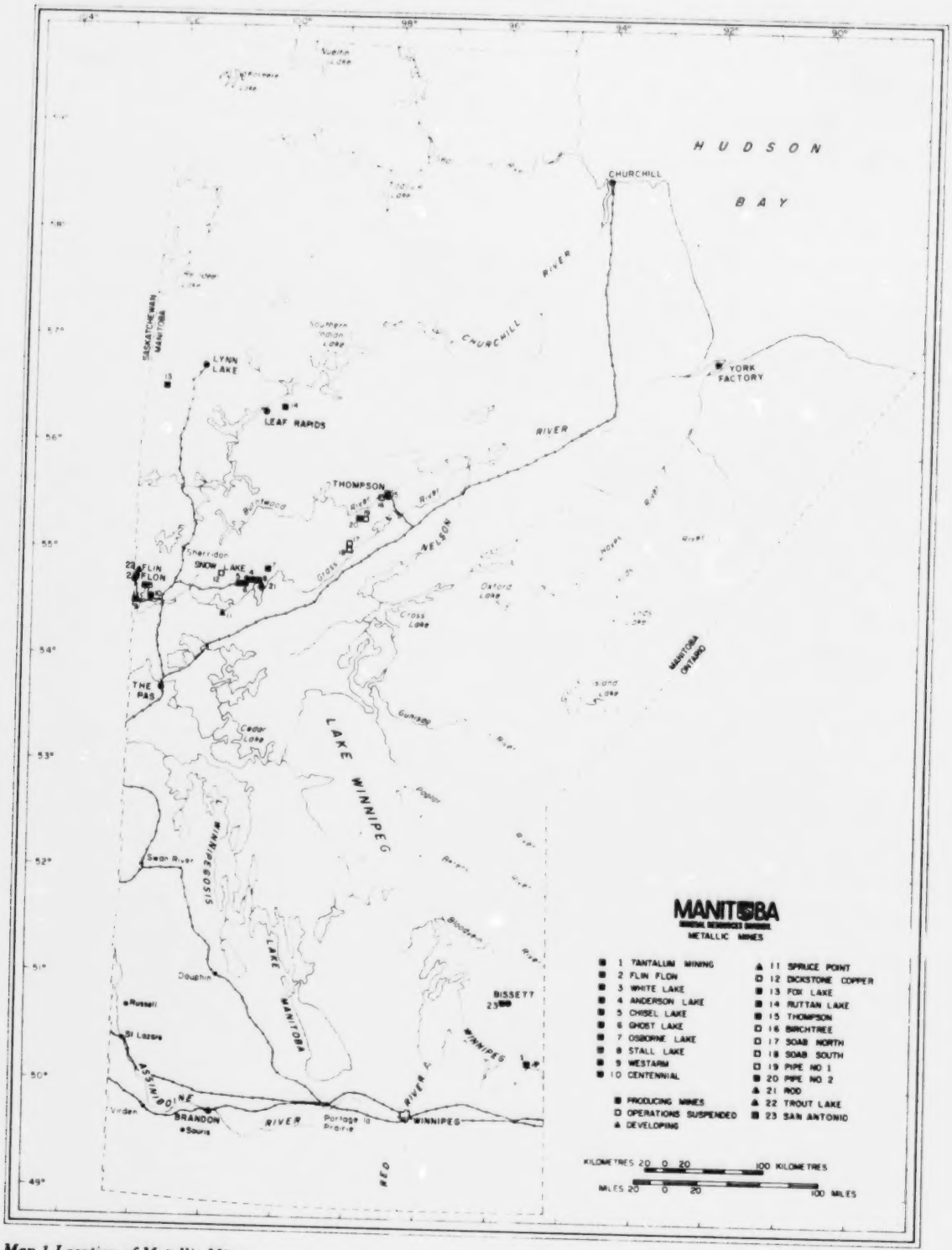
Ruttan open pit operations were terminated in December 1980 and during 1981 production from underground operations was supplemented with ore stockpiled on surface to maintain the milling rate of 40,000 tons per week. Production from the Ruttan mine averaged 5500 - 6000 tons per day during 1981 but this was reduced to 4500 tons per day in 1982. Ore reserves as of December 31, 1981 were reported as 24,809,000 tons grading 1.51% copper and 1.17% zinc above the 2000 foot level. The ore zone is open at depth. Copper and zinc concentrates produced by the mill are trucked to Lynn Lake for rail shipment. Noranda contracted for all the copper concentrates for the first ten years of operation. These are treated at Flin Flon as capacity permits, the balance going to Noranda, Quebec. All zinc concentrates during the year were treated at Flin Flon.

At *Lynn Lake*, the Farley and "A" shafts are capped and the mill is being kept intact for possible future use.

Tantalum Mining Corporation of Canada Limited (Tanco) continued production of tantalite concentrates from its Bernic Lake mine during 1981. The mill processed 152,000 tons of ore from underground and reprocessed 55,000 tons of tailings from the surface disposal area.

Mill recoveries improved significantly in the last half of 1981 as a result of revisions to the mill circuit, improved operating procedures and a decision to reduce throughput from 1000 to 800 tons per day. Ore mined averaged 0.12% tantalum oxide, very close to reserve grade. Market demand and price for tantalum softened dramatically during the year.

Ore reserves as at December 31, 1981 were reported as 1,154,000 tons tantalum ore with an



Map 1 Location of Metallic Mines

average drill indicated grade of 0.14% Ta_2O_5 and 743,000 tons of stored tailings grading 0.065% Ta_2O_5. Lithium and cesium ore reserves were reported as 7,750,000 tons grading 2.76% LiO_2 and 300,000 tons grading 23.0% Cs_2O respectively.

Precious Metals

San Antonio Joint Venture Ltd. was formed in August 1980 when Brinco Mining Ltd. and New Forty-Four Mines Limited signed a joint venture agreement to reactivate the San Antonio gold mine in Bissett. The mine had been dormant since 1968 when a fire destroyed the hoistroom. The ore zones were developed by a shaft and three winzes to a total depth of 4980 feet. During 1981, rehabilitation of the mine continued, stope development was initiated and exploration continued. A mill was built on the site of the former mill which burnt down. This mill has a capacity of 550 tons per day or approximately 200,000 tons per year. Commercial production at the mill commenced in January 1982. Ore reserves on January 1, 1982 were reported as 882,000 tons grading 0.19 oz gold per ton. The mill has the potential for handling ore from adjacent properties on a custom basis. Additional land has been staked and optioned by the joint venture and exploration activities were carried out on several sites.

In 1979 *Sherritt Gordon Mines Limited* acquired an option on the former Royal Agassiz gold property, now held by Comiesa Corporation, a controlled subsidiary of Agassiz Resources Ltd. Sherritt Gordon Mines Limited carried out surface diamond drilling in 1980 and continued the evaluation in 1981 by deepening the shaft to 835 feet and establishing a new level at 800 feet to permit drilling from underground.

H.R.N.D. Milling and Mining Co. established a road to the former Gold Pan X property in the Bissett area where a mill is being assembled to process stockpiled ore from a previous operation.

Industrial Minerals/Structural Materials

The production and value of industrial minerals and structural materials are given in Table 1 of the Statistical Supplement.

A large face-brick plant at Lockport, near Winnipeg, is operated by Red River Brick and Tile Co. using *stoneware clay* from the Ste. Rose du Lac area, *shale* from the Pembina Mountain area and *sand* from local sources.

Non-swelling bentonite, used mainly in clarification of petroleum and vegetable oil, is produced by Pembina Mountain Clays near Morden.

Gypsum is produced by Domtar Inc. at Gypsumville and by Westroc Industries at Harcus near Amaranth.

Portland Cement is produced at Fort Whyte, near Winnipeg, by Canada Cement Lafarge and Inland Cement Industries, using limestone from quarries near Steep Rock. A few kilometres southeast of Steep Rock, a lime kiln, operated by Steel Brothers Canada Limited, produces both high-calcium lime and high-magnesium lime from *limestone* and *dolomite* quarried in the Interlake area. These rock types, along with granite, are the source of crushed stone used by several operators for highway construction and in other construction projects.

Dolomitic limestone at Garson is produced by Gillis Quarries Limited and is marketed as *Tyndall stone*. Coldspring Granite and Midwest Quarries Limited operate *granite* quarries near Lac du Bonnet and Whitemouth, respectively.

Peat moss is produced primaily for horticultural purposes by Fisons-Western Corporation from four bogs in the Julius-Elma area. A new "value-added" plant at Elma combining fertilizer with peat moss, is scheduled for completion in the fall of 1982.

High quality *silica sand* from Black Island in Lake Winnipeg is processed by Steel Brothers for use as foundry sand, and for glass making at Redcliff, Alberta.

Sand and gravel are extracted from about four hundred pits at various locations throughout the Province.

Mineral Exploration

A high level of exploration activity was maintained in the Province during the year. Expenditures on mineral exploration in Manitoba during 1981 are estimated at $32 million compared with $28.5 million in 1980. The total area of claims recorded during the year was 223 845 hectares (553,133 acres) compared with 201 979 hectares (499,102 acres) in 1980 and is the highest level of claim staking recorded since 1970.

As in previous years, the search for *base metals* continued to attract the major share of exploration activity in the province with the Flin Flon — Snow Lake — Sherridon area attracting the most interest. Fuelled by the continuing high world market price for the metal,

gold activity in the Province during the year was the highest in recent times. *Uranium* exploration continued in northwestern Manitoba and there was sustained interest in Manitoba's *potash* deposits located in the southwestern corner of the Province.

Base Metals

In the *Flin Flon — Snow Lake — Sherridon* area exploration activities for base metals comprised geological, geophysical and diamond drilling programs. Companies active in this area during the year included Hudson Bay Exploration and Development Company Limited, Granges Exploration AB, Falconbridge Nickel Mines Limited, Corporation Falconbridge Copper, Canadian Nickel Company Limited, Selco Mining Corporation Limited, Sherritt Gordon Mines Limited, Morrison Petroleums Ltd., SMD Mining Co. Ltd. and Shell Canada Resources Limited.

Canadian Nickel Company Limited also carried out a geochemical survey in the *Mafeking* area.

Companies active in the *Lynn Lake-Ruttan Lake* region during the year included Sherritt Gordon Mines Limited, Hudson Bay Exploration and Development Company Limited, SMD Mining Co. Ltd., Falconbridge Nickel Mines Limited, Noranda Exploration Company Limited and BP Minerals Limited. Programs included geological and geophysical surveys and diamond drilling.

In the *Russell Lake-Notigi Lake* area, Manitoba Mineral Resources Ltd. conducted geophysical surveys and drilling programs on a number of properties.

In *Central Eastern Manitoba* geological and geophysical programs were conducted by BP Minerals Limited on Island Lake; by Manitoba Mineral Resources Ltd. in the Beaver Hill Lake area; and by Comaplex Resources International Ltd. at Knee Lake. Reconnaissance programs were carried out by SMD Mining Co. Ltd. in the Knee-Oxford Lakes area and by Noranda Exploration Company Limited at Island Lake.

In the *Thompson Nickel Belt*, exploration for nickel continued during the year with geophysical and drilling programs by Inco Metals Company, Falconbridge Nickel Mines Limited and Granges Exploration AB. Amax of Canada Limited conducted a geophysical program in the Cedar Lake area.

Shell Canada Resources Limited conducted a geophysical program in the *William Lake* area. Falconbridge Nickel Mines Limited carried out drilling programs in the Gillam area in *Northern Manitoba* and on Lake Winnipeg near Black Island in *Southwestern Manitoba*. Canadian Nickel Company Limited carried out geological, geophysical and drilling programs in the Bird River area.

Tantalum

Tantalum Mining Corporation of Canada Limited continued geological, geochemical and drilling investigations for tantalum and lithium in the Bird River area in *Southeastern Manitoba* and at Red Sucker, Red Cross and Cross Lakes in *Central Eastern Manitoba*.

Uranium

Exploration for uranium in *Northwestern Manitoba* included a drilling program by Esso Minerals Canada in the Veal Lake area, geophysical surveys by Mid-North Resources Limited in the Kasmere Lake area and airborne radiometric surveys and prospecting by SMD Mining Co. Ltd. in the Miller Lake area. Zelon Enterprises Ltd. carried out geological, geophysical and geochemical surveys near Kasmere Lake.

In *Southern Manitoba*, Noranda Exploration Company Limited carried out a drilling program on a property near Fisher Branch.

Gold

Interest in gold in Manitoba increased in 1981 due to the sustained higher price for this metal. Sherritt Gordon Mines Limited completed a shaft-deepening program on the former Royal Agassiz property near *Lynn Lake* optioned from Comiesa Corporation. New Forty-Four Mines Limited financed an exploration program on the claims of its controlled subsidiary, Portage Avenue Gold Mines Ltd., in the *Bissett* area. This program included prospecting, surface geology, sampling and diamond drilling and resulted in the indication of probable ore reserves of 2995 tons at 0.30 oz gold per ton. Hudson Bay Exploration and Development Company Limited completed a 12,718 foot drilling program on the former Nor-Acme property near *Snow Lake* which it had optioned from Nor-Acme Gold Mines Limited. A potential reserve of 1,616,940 tons averaging 0.16 oz gold per ton was indicated.

A number of other companies were involved in geological, geophysical and drilling programs in the *Flin Flon-Snow Lake* area. They included Kerr Addison Mines Limited on the old Gurney Gold Mine property; Camflo Mines Li-

mited on the Squall Lake mineralized zone; Norman Mines Ltd. on the former Ferro Gold Mine; Granges Exploration AB on the Puffy Lake mineralized zone under a joint venture agreement with Maverick Mountain Resources Ltd.; Gold Fields Mining Corporation; Ram Petroleums Ltd.; Cangold Ltd.; Mid-North Resources Limited; Noranda Exploration Company Limited; J. L. Deleen and Associates and McCafferty Lake Exploration Ltd.

Camflo Mines Limited carried out an airborne geophysical survey at Beaucage Lake in the *Lynn Lake* area.

In *Central Eastern Manitoba*, BP Minerals Limited, W. Bruce Dunlop Limited and a number of prospectors were active, mainly around Island Lake.

In the Bissett area of *Southeastern Manitoba*, companies involved in various geological, geophysical and drilling programs included Esso Minerals Canada; Calmflo Mines Limited; Brinco Limited; Belmoral Mines Limited; Noranda Exploration Company Limited; Great Basins Petroleum Co.; Riocanex Inc.; Corporate Oil and Gas Limited; Gold Lake Mines Inc.; Augusta Gold Mines Ltd.; Mid-North Resources Limited; Canadian Nickel Company Limited and several prospectors.

In the Falcon Lake area, Whiteshell Ventures Ltd. carried out geological mapping, trenching and sampling on the Sunbeam-Kirkland deposits.

Petroleum Branch

The Petroleum Branch administers provisions under The Mines Act dealing with exploration, development and production of oil and natural gas and is also responsible for administering The Pipe Line Act and sections of The Gas Storage and Allocation Act. The Branch conducts technical studies and provides technical assistance to The Oil and Natural Gas Conservation Board in matters relating to salt water disposal, enhanced recovery projects, unitization agreements, and other Board responsibilities. Assistance is provided to The Mining Board in resolving disputes relating to surface rights.

The Administration Section of the Branch, located in Winnipeg, is responsible for administration of The Mines Act and regulations governing the disposition of Crown oil and natural gas rights, including sales of leases and exploration reservations by public tender; the collection of lease rentals and Crown oil royalties; and the recording and publication of statistics on crude oil and salt water production, salt water disposal, and information on wells drilled.

The *Engineering and Geology Section*, also located in Winnipeg, processes applications relating to drilling and production operations, oil and salt water pipe lines, underground storage of natural gas, and geophysical and drilling licenses. The Section also provides consultation to the petroleum industry and carries out special studies relating to Manitoba's oil and natural gas potential and reserves.

The *Petroleum Inspection Section* is located in Virden and is responsible for the inspection and monitoring of geophysical, drilling and production operations and investigation of complaints arising from petroleum operations. This Section also provides information to the petroleum industry and the general public.

Petroleum Production and Exploration

Drilling activity in 1981 was up significantly over 1980, reflecting a renewed interest by petroleum exploration companies. Most of this activity was undertaken in the Waskada and Kirkella areas following discoveries made in 1980.

Sales value of oil produced in 1981 rose by $9.1 million to $64.0 million reflecting increased wellhead prices. Production decreased by about 3.7% to 542 695 cubic metres. This decrease is due to the advanced stage of production from the older producing pools in the Province and is not considered abnormal. The average wellhead price on January 1, 1981 was $111.76/$m^3$. Prices rose July 1 ($118.52/m^3) and October 1 ($133.27/$m^3$), with a further increase to $147.11/$m^3$ on January 1, 1982. Total expenditures on oil and gas activity in the province reported by the industry for 1981, (including exploration, drilling, provincial petroleum royalties and taxes, etc. but excluding income taxes) rose by $16.9 million dollars from $38.3 million in 1980 to $55.2 million in 1981. Geophysical activity stayed at about the same level as in 1980 with 11 programs.

A total of 62 wells were drilled, the greatest number since 1969. This compares with 27 wells in 1980 and 25 wells in 1979. Forty-seven wells were completed as potential oil wells giving a success ratio of 75%. Fifteen of the 62 wells drilled were abandoned "dry".

Thirty of the 62 wells drilled in 1981 were classified as exploratory wells at the time of licensing. Five of the exploratory wells were deep tests drilled through the entire sedimentary column to the Precambrian while another 6 wells were drilled to the Devonian. The total number of metres drilled was 61 011.

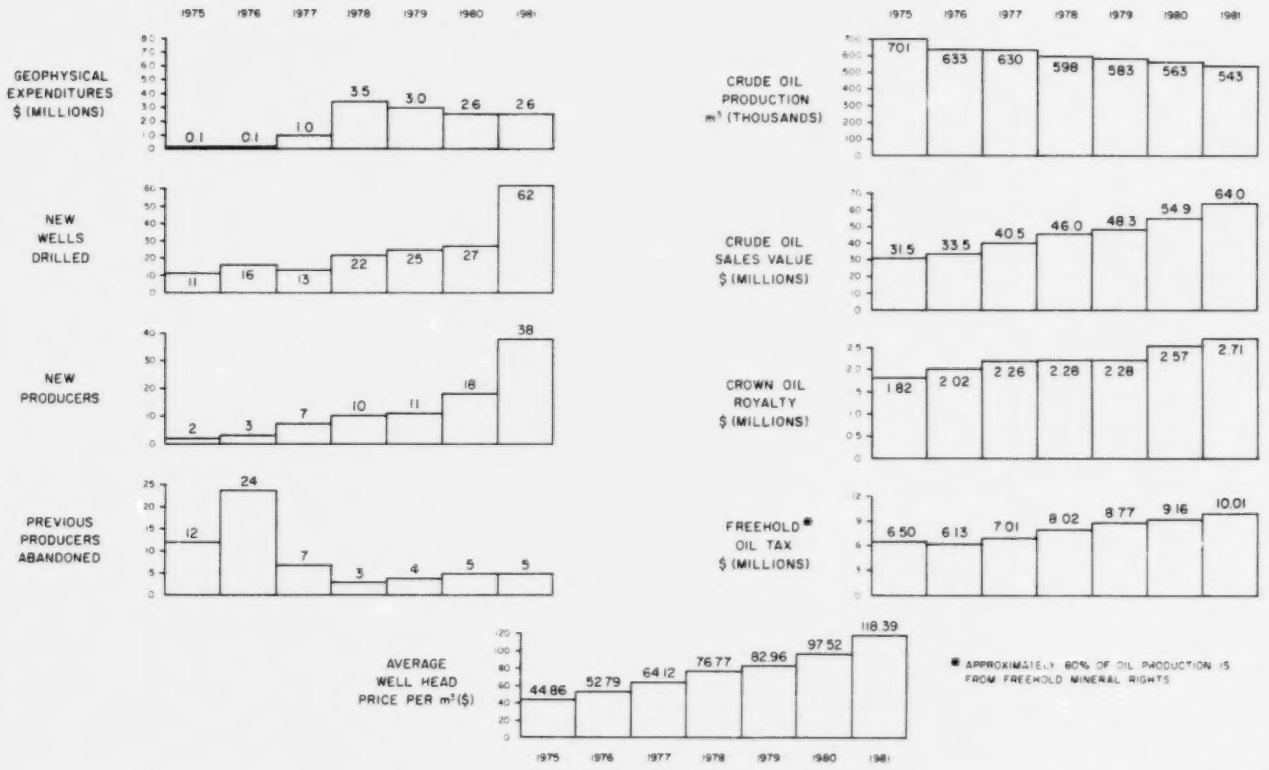
Omega Hydrocarbons Ltd. was the most active company in 1981, drilling a total of 24 wells in the Waskada area, all of which were completed as potential oil wells. Significant in this activity was the discovery of a new Mississippian pool in the area and confirmation of the potential of the Lower Amaranth formation. The Company first tested the Lower Amaranth (elsewhere referred to as the Spearfish) formation in 1980 and obtained the first known production from that formation in Canada. Development of both these zones continued throughout 1981.

Cobra Oil and Gas Corporation followed up its successful 1980 exploratory well in the South Pierson area, drilling 5 wells in 1981. Three of these wells were completed as potential oil wells. Potential for producion from the Lower Amaranth formation in this area is also considered to be significant.

Saskoil Resources Inc. drilled 10 wells in 1981, 8 of which were successful oil wells in the West Kirkella area. This activity followed Saskoil's first well in this area in 1980. Saskoil also drilled one successful development well in the North Virden Scallion Field and a dry hole in the Sinclair area.

Rideau Petroleums Ltd., which first discovered the West Kirkella Field in 1978, proceeded with further development work in the Kirkella area and drilled a total of 7 successful wells.

Performance of the Petroleum Sector
1975 - 1981


1975 1976 1977 1978 1979 1980 1981
GEOPHYSICAL EXPENDITURES $ (MILLIONS)
0.1 0.1 1.0 3.5 3.0 2.6 2.6
NEW WELLS DRILLED
11 16 13 22 25 27 62
NEW PRODUCERS
2 3 7 10 11 18 38
PREVIOUS PRODUCERS ABANDONED
12 24 7 3 4 5 5
CRUDE OIL PRODUCTION m³ (THOUSANDS)
701 633 630 598 583 563 543
CRUDE OIL SALES VALUE $ (MILLIONS)
31.5 33.5 40.5 46.0 48.3 54.9 64.0
CROWN OIL ROYALTY $ (MILLIONS)
1.82 2.02 2.26 2.28 2.28 2.57 2.71
FREEHOLD* OIL TAX $ (MILLIONS)
6.50 6.13 7.01 8.02 8.77 9.16 10.01
AVERAGE WELL HEAD PRICE PER m³($)
44.86 52.79 64.12 76.77 82.96 97.52 118.39
* APPROXIMATELY 80% OF OIL PRODUCTION IS FROM FREEHOLD MINERAL RIGHTS

Clarion Petroleums Ltd. embarked on a 9 well exploratory program in the Province in 1981 and was successful with one well in the Deloraine area.

Lease Sales

Two Crown oil and natural gas lease sales were conducted in 1981, on May 13 and October 28, from which the Crown received $1,729,157. Eighty-five lease parcels comprising 12 312 hectares were disposed of for total revenue of $1,109,988. Five exploration reservations, covering 5 376 hectares, garnered $619,169.

New record prices per hectare were set at both sales. The results of the 1981 sales brought the total Crown lands under disposition at year end to 63 097 hectares (22 291 in Exploration Reservations and 40 806 under Lease).

Petroleum Royalties and Taxes

During 1981, the Crown received approximately $2.7 million in royalties from Crown oil production and an additional $10.0 million from taxes levied on producing freehold mineral rights under The Oil and Natural Gas Tax Act.

An additional $148,000 was received as rental fees on existing Crown leases and exploration reservations while $3,350 was paid for registration and licensing fees.

Oil Pricing Agreement

On September 1, 1981 the Government of Canada and Alberta reached an oil pricing and taxation agreement. Following the initial agreement with Alberta, the government of Canada signed separate agreements with the Provinces of British Columbia and Saskatchewan. These agreements covered a wide range of issues and were the basis upon which Manitoba entered into talks with the Federal Government in early December, 1981.

Interim agreement was reached between the two governments with regard to definitions and pricing. As of Janurary 1, 1982, for any quality of Manitoba "conventional old oil" the field price will be determined by deducting the appropriate transportation charge from the laid down price in Montreal of equivalent Alberta crude, the field price of which was set out in the September 1, 1981, Alberta - Canada agreement.

Also effective January 1, 1982, "conventional new oil" produced in the Province of Manitoba will qualify for the New Oil Reference Price (NORP) with the field price determined in the same manner as that employed for "conventional old oil".

The necessary Federal authorizations and Provincial administrative procedures have subsequently been put into place to allow Manitoba producers to receive the new prices in 1982.

Oil and Natural Gas Conservation Board

The Oil and Natural Gas Conservation Board held no hearings in 1981 but issued the following Board Orders:

Salt Water Disposal Permit No. 111 - authorizing the conversion of the well, Tundra Tilston SWD A9-31-5-29 WPM, for the use as a salt water disposal well.

Salt Water Disposal Permit No. 112 - authorizing the conversion of the well, Beaverhead Daly SWD 1C-3-10-28 WPM, for the use as a salt water disposal well.

Salt Water Disposal Permit No. 113 - authorizing the conversion of the well, Omega Waskada SWD 15-1-12-29 WPM, for use as a salt water disposal well.

Salt Water Disposal Permit No. 114 - authorizing the conversion of the well, Omega Waskada SWD Prov. 1-30-1-25 WPM, for use as a salt water disposal well.

Geological Services Branch

The Geological Services Branch comprises three sections: the Geological Survey, Draughting and Laboratory Services.

The Geological Survey undertakes geological mapping, mineral deposit studies and other geoscientific investigations designed to provide an up-to-date geological framework and mineral data base for the Province for use in mineral resource appraisal, mineral exploration, land-use planning and in addressing environmental concerns.

The Laboratory Services provides the necessary rock preparation, warehousing and analytical support for the Division's geological and mineral evaluation activities while the Draughting Section provides complete cartographic and draughting services to the Division.

A Report of Field Activities, the new 1:1 000 000 scale Surficial Geological Map of Manitoba and 9 Preliminary geological maps were released on November 18 in conjunction with the Annual Meeting with Industry in Winnipeg. A total of 134 delegates from industry, universities, and other government agencies attended the meeting at which oral presentations were given by staff of the Mineral Resources Division, the Geological Survey of Canada and the Centre for Precambrian Studies, University of Manitoba. The nature and scope of geological, mineral deposit and geophysical investigations conducted in the Province were reviewed in the talks and in a concurrent Poster Session.

Precambrian Mapping

In 1981 new 1:50 000 and 1:20 000 scale geological mapping programs were initiated in the *Island Lake* area and on *Setting Lake*. Reconnaissance surveys were conducted on *Zangeza Bay (Reindeer Lake)* in the Brochet and Big Sand areas, at *Flin Flon*, and around *Little Stull Lake*, in preparation for major projects to be undertaken during 1982. Mapping on *McMillan Lake*, in the *McNeill Lake* and *Pistol Lake* area, on *Granville* and *Beaucage Lakes*, and east of the *Issett Channel*, completed gaps in the coverage and data interpretation stemming from earlier projects.

The work on Granville Lake and the Churchill River provided new information which led to a review of earlier stratigraphic concepts for the area and renewed exploration interest.

On Setting Lake, the detailed mapping of well preserved metasedimentary formations suggests a stratigraphic continuity and possible correlation between Ospwagon group rocks in the Thompson Nickel Belt and metasediments more typical of the Churchill Province.

Mineral Deposit Studies

Mineral deposit investigations near the *Ruttan mine* focussed on the detailed mapping of felsic volcanics that appear in large part to be subaerial in origin. An Open File report on mineral occurrences in the area is currently in press.

In the *Flin Flon* region known mineral occurrences were mapped in detail at scales ranging from 1:100 to 1:500. Gold showings in the Tartan, Mikanagan, Alberts and Embury Lakes areas were investigated, as were sulphide showings on Kississing and Kipahigan Lakes. Three hundred and fifty samples were collected from granitic intrusions in the Flin Flon area in order to investigate their base metal content.

On *Island Lake*, the Island Lake Gold Mines and its surroundings were mapped and sampled, and the inventory of ultramafic occurrences and a study of their setting completed.

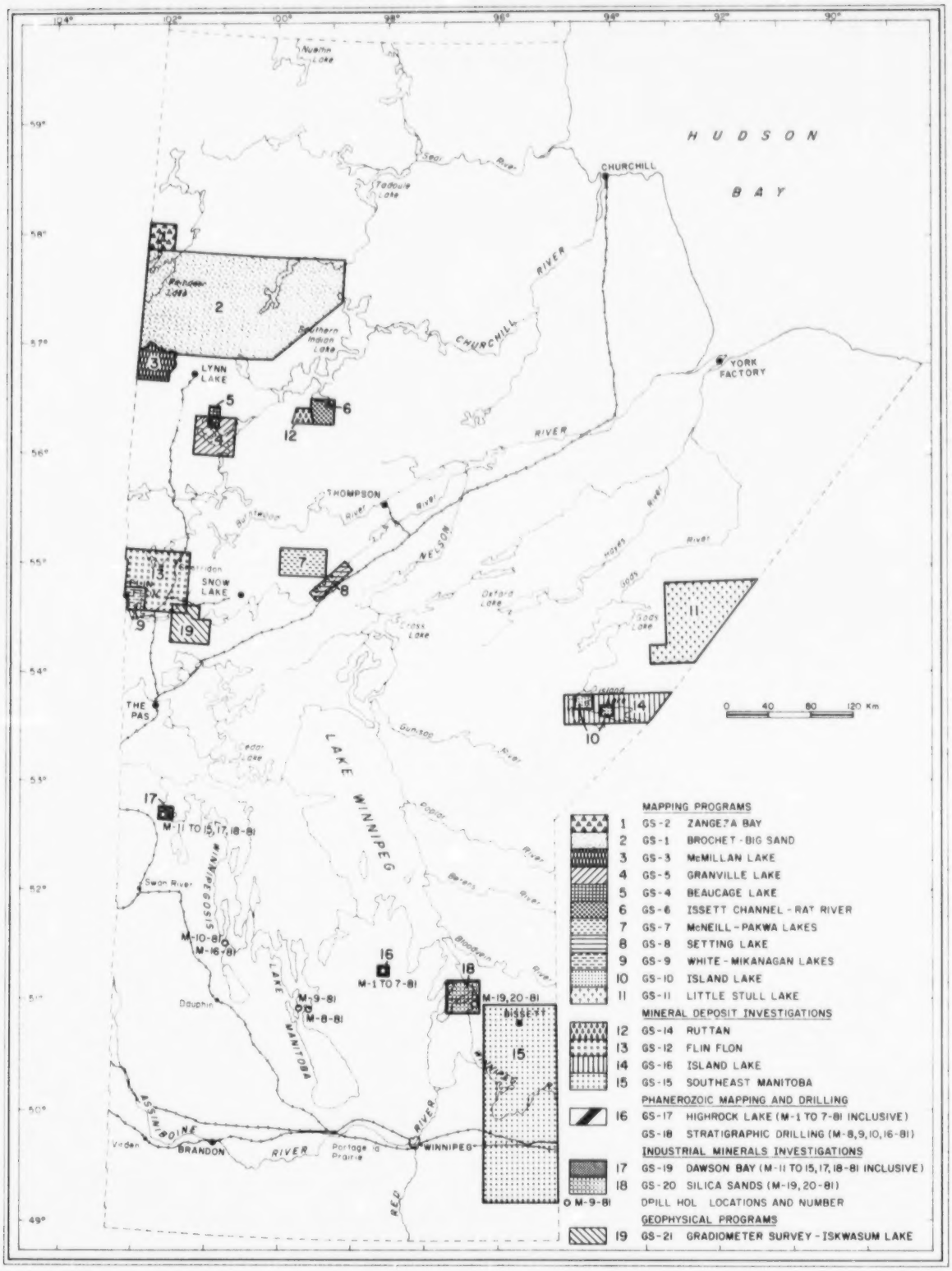
In southeastern Manitoba, chromite layers in the *Bird River Sill* were mapped and sampled in detail in order to evaluate their potential for platinum group metals. A detailed investigation and documentation of the base and precious metal mineral occurences in this part of the Province has been initiated to extend and expand upon the descriptions contained in the present Mineral Inventory.

Stratigraphic/Industrial Minerals Program

The *limestone resources* and potential of the *Dawson Bay* area are being re-evaluated on the basis of new drill hole information acquired as part of the Branch's stratigraphic and industrial minerals drilling program.

Industrial minerals investigations were expanded in 1981 with the commencement of a silica resources study. Initially, attention has been directed to the sandstone of the Winnipeg Formation.

In the *High Rock Lake* area near Red Rose, additional information on the form of the Precambrian inlier has been obtained from mapping of surface exposures and shallow drilling. A total of 122 m of core from 7 holes has provided new insights as to the nature of the cover rocks associated with this apparently circular crater-like feature.



Map 2 Location of Field Projects 1981.

Geochronology

A summary of rubidium-strontium isotope work, conducted under contract by the Centre for Precambrian Studies, University of Manitoba, was included in the Report of Field Activities, 1981.

Geophysical Survey

The results of the 1980 aeromagnetic gradiometer survey of the Weldon Bay-Goose Lake region were released on June 30, 1981, as GSC Open File 756, and comprised ten, 1:20 000 scale vertical gradient and ten total field aeromagnetic maps, together with multi-coloured 1:50 000 scale composites which greatly assist inspection of the survey results. The adjacent area to the east (Iskwasum Lake) was flown in June, 1981, and the results will be released early in 1982 using a format similar to that adopted for the Weldon Bay survey. These geophysical surveys are funded equally by the Federal and Provincial governments.

Analytical Laboratory

During the year ending March 31, 1982 the Analytical Laboratory carried out 12,769 silicate rock determinations in support of the work of Branch geologists. In addition, 492 samples were prepared for assay and 1,960 determinations for precious and base metals were carried out for mineral exploration companies and individual prospectors.

The Analytical Laboratory provided 218 sulphur determinations and 121 specific gravity measurements on crude oil for the Petroleum Branch in order to establish the quality of the oil for the New Oil Reference Price program.

The Geochemical Section of the laboratory performed 10,707 geochemical determinations in support of work undertaken by Branch geologists.

Publications

A list of publications issued, at press or in preparation during the year, is given in Table 9 of the Statistical Supplement. A list of Preliminary Maps issued during the year is given in Table 10.

STATISTICAL SUPPLEMENT
1981/82

TABLE 1

Comparison of Manitoba Mineral Production and Values 1980 and 1981

	Revised 1980 (Jan.-Dec.)			Estimated 1981 (Jan.-Dec.)		
	Quantity (Imperial)	Value	Quantity (Metric)	Quantity (Imperial)	Value	Quantity (Metric)
Metals						
Cadmium	53,405 lbs.	$ 177,461	24,224 kg	93,000 lbs.	$ 208,000	42,000 kg
Cobalt	952,851 lbs.	27,847,070	432,206 kg	555,000 lbs.	13,857,000	247,000 kg
Copper	142,752,110 lbs.	168,090,610	64,751,268 kg	127,374,000 lbs.	127,795,000	57,776,000 kg
Gold	51,148 oz.	36,626,403	1,590,880 g	40,000 oz.	22,114,000	1,248,000 g
Lead	1,270,700 lbs.	627,090	576,380 kg	809,000 lbs.	360,000	367,000 kg
Nickel	86,408,737 lbs.	342,556,574	39,194,344 kg	61,661,000 lbs.	254,996,000	27,969,000 kg
Selenium	119,671 lbs.	1,346,549	54,282 kg	57,000 lbs.	620,000	26,000 kg
Silver	981,273 oz.	23,647,289	30,521 kg	900,000 oz.	11,277,000	28,000 kg
Tantalum	254,107 lbs.	21,809,600	115,261 kg	229,000 lbs.	23,500,000	104,000 kg
Tellurium	11,755 lbs.	267,968	5,332 kg	7,000 lbs.	50,000	3,000 kg
Zinc	94,919,180 lbs.	41,811,899	43,054,616 kg	86,789,000 lbs.	47,240,000	39,367,000 kg
TOTAL METALS		$664,808,513			$502,017,000	
Industrial Minerals						
Clay Products	—	$ 3,500,000	—	—	$ 3,750,000	—
Cement	730,000 tons	45,016,000	662,000 tonnes	689,000 tons	48,946,000	625,000 tonnes
Gypsum	158,437 tons	1,009,481	143,732 tonnes	183,000 tons	1,417,000	166,000 tonnes
Lime	—	3,500,000	—	—	4,296,000	—
Peat Moss	68,232 tons	7,541,121	61,899 tonnes	96,000 tons	11,500,000	87,000 tonnes
Quartz	277,787 tons	2,536,616	252,004 tonnes	281,000 tons	2,821,000	255,000 tonnes
Sand & Gravel	13,425,314 tons	28,005,205	12,179,240 tonnes	14,164,000 tons	30,580,000	12,849,000 tonnes
Stone	2,301,598 tons	9,705,090	2,087,975 tonnes	2,425,000 tons	10,450,000	2,200,000 tonnes
TOTAL INDUSTRIAL MINERALS		$100,813,513			$113,760,000	
Fuels						
Petroleum	3,545,918 bbls.	$ 54,948,288	563,482 m^3	3,417,000 bbls.	$ 64,055,000	543,000 m^3
GRAND TOTAL		$820,570,314			$679,832,000	

Sources: Energy, Mines & Resources, Ottawa
Manitoba Mineral Resources Division

TABLE 2

A Comparison of the Value of Manitoba Metals, Industrial Minerals, Fuels and Total Mineral Production From 1971 - 1981 (Calendar Year)

Year	Metals	Industrial Minerals	Fuels	Total
1971	$284,315,156	$ 30,185,756	$15,412,570	$329,913,482
1972	$272,973,716	$ 35,729,741	$14,582,749	$323,286,206
1973	$363,649,650	$ 38,416,350	$17,147,991	$419,213,991
1974	$413,529,719	$ 45,555,570	$27,169,166	$486,254,455
1975	$452,235,956	$ 50,661,862	$31,451,104	$534,348,922
1976	$412,300,937	$ 69,173,428	$33,557,169	$515,031,534
1977	$446,691,225	$ 81,596,730	$40,428,213	$568,716,168
1978	$338,122,693	$ 83,696,147	$45,937,440	$467,756,280
1979	$510,048,686	$ 94,278,656	$48,402,790	$652,730,132
1980	$664,808,513	$100,813,513	$54,948,288	$820,570,314
1981*	$502,017,000	$113,760,000	$64,055,000	$679,832,000

* Estimate

TABLE 3

Mineral Dispositions in Good Standing at Calendar Year End 1977 to 1981

Mining	1977		1978		1979		1980		1981		
	No.	Acres	No.	Acres	No.	Acres	No.	Acres	No.	Acres	Hectares
Mining Claims	4,666	208,514	4,238	185,928	4,157	181,215	2,996	125,020	6,875	1,835,039	742 614
Claim Blocks*	1,841	770,547	2,184	881,080	2,820	1,165,472	3,551	1,479,657	—	—	—
Order-in-Council Leases	4,184	295,000	4,184	295,000	4,184	295,000	4,184	295,000	4,184	295,000	119 382
Permits	19	1,185,969	13	576,513	8	356,096	14	956,282	13	723,570	292 818
Explored Area Leases	35	40,242	36	33,463	38	34,201	39	34,409	38	35,513	14 371
Production Leases	24	39,115	24	37,278	22	29,713	27	29,993	29	31,336	12 681
Miscellaneous Mineral Leases	—	—	—	—	—	—	1	996	1	996	403
Potash											
Permits	—	—	—	—	—	—	1	43,390	1	43,390	17 559
Quarrying											
Leases	73	6,189	171	12,914	241	20,221	289	22,717	315	23,670	9 579
Exploration Permits	11	1,448	17	2,826	6	734	10	2,305	13	2,336	945
Peat											
Leases	5	2,183	13	6,563	15	6,606	14	6,468	13	6,466	2 617
Exploration Permits	1	240	2	802	—	—	—	—	8	4,347	1 759
	10,859	2,549,447	10,882	2,032,367	11,491	2,089,258	11,126	2,996,237	11,492	3,001,663	1 214 728

**Manitoba Regulation 147/81, which came into effect July 11, 1981, discontinued the use of the term "claim blocks"*

TABLE 4

Mineral Dispositions Issued Each Calendar Year 1977 to 1981

Mining	1977 No.	1977 Acres	1978 No.	1978 Acres	1979 No.	1979 Acres	1980 No.	1980 Acres	1981 No.	1981 Acres	1981 Hectares
Mining Claims	88	2,730	24	906	206	8,126	134	5,131	1,318	553,133	223 845
Claim Blocks*	729	263,445	889	392,821	1,061	478,199	1,114	493,971	—	—	—
Permits	7	384,355	3	111,083	6	298,771	8	742,767	3	231,944	93 864
Explored Area Leases	22	28,511	1	1,882	2	738	1	208	1	1,872	758
Production Leases	7	12,067	1	44	2	80	5	280	3	1,383	560
Miscellaneous Mineral Leases	—	—	—	—	—	—	1	996	—	—	—
Potash											
Permits	—	—	—	—	—	—	1	43,390	—	—	—
Quarrying											
Leases	73	6,189	98	6,725	70	7,092	48	3,327	39	1,900	769
Exploration Permits	11	1,448	4	724	3	539	7	1,895	5	439	178
Casual Permits	81	—	57	—	84	—	96	—	77	—	—
Permissions to Remove	427	—	428	—	407	—	381	—	416	—	—
Peat											
Leases	5	2,183	8	4,380	2	259	—	—	—	—	—
Exploration Permits	1	240	2	802	—	—	—	—	8	4,347	1 759

**Manitoba Regulation 147/81, which came into effect July 11, 1981, discontinued the use of the term "claim blocks"*

TABLE 5

Revenue from Mining and Quarrying (to March 31)

	1980/81	1981/82
Disposition and other fees, rentals, forfeiture of deposit, cash payment in lieu of work commitment, sale of maps, etc.	$ 375,701	$ 440,029
Mining Claim Lease Tax	76,670	76,566
Royalties *(from industrial minerals under The Mines Act, M 160)*	608,592	591,813
The Mining Royalty and Tax Act *(M 180)*	508,988	5,969,094*
The Mining Tax Act *(M 125)*	23,053,040	8,768,797
Total	$24,622,991	$15,846,299

* *Collection of a royalty under the Mining Royalty and Tax Act was discontinued after December 31, 1980. The revenue shown represents reassessments for the period prior to that date.*

TABLE 6

(1973-1981)
Manitoba Petroleum Statistics
(Calendar Year)

	1973	1974	1975	1976	1977	1978	1979	1980	1981
Geophysical Licenses Issued	—	—	1	3	2	5	10	9	11
Geophysical Expenditures ($)	—	—	106,500	118,308	1,046,220	3,451,370	3,000,000	2,600,000	2,600,000
Drilling Licenses Issued	19	22	9	16	21	16	27	27	71
New Wells Drilled	17	22	11	16	13	22	25	27	62
New Oil Producers	—	7	2	3	7	10	11	18	38
New Wells Abandoned	17	14	8	10	2	6	9	9	15
Metrage Drilled	14 081	23 784	8 805	13 515	11 584	18 329	20 537	23 508	61 011
Wells Capable of Production (December)	882	871	831	821	804	808	811	823	853
Wells Producing (December)	719	714	686	688	701	703	705	720	748
Previous Producers Abandoned	16	30	12	24	7	3	4	5	5
Other Wells Abandoned	2	3	1	3	1	2	1	0	3
Crude Oil Production (m^3)	807 882	754 667	701 459	633 322	630 466	598 354	583 377	563 482	542 695
Water Production (m^3)	3 985 577	3 994 539	3 977 222	4 021 932	4 228 083	4 075 178	3 946 337	4 171 051	4 565 210
Total Fluid Production (m^3)	4 793 459	4 749 206	4 678 681	4 655 254	4 858 549	4 673 532	4 529 714	4 734 533	5 107 705
% Water Cut	83	84	85	86	87	87	87	83	89
Average Oil Production (m^3 per day)	2 213	2 068	1 922	1 730	1 727	1 639	1 598	1 540	1 487
Total Oil Sales ($)	17,155,080	27,181,792	31,452,592	33,532,609	40,457,038	45,953,383	48,403,312	54,948,288	64,054,832
Crown Oil Royalty ($ received)	403,729	1,598,907	1,823,361	2,023,828	2,263,015	2,281,355	2,280,162	2,574,515	2,714,733
Freehold Mineral Tax ($ received)	143,572	5,216,314	6,498,072	6,128,261	7,012,188	8,017,968	8,768,511	9,159,426	10,005,107
Total Crown Revenue ($ received)	547,301	6,815,221	8,321,433	8,152,089	9,275,203	10,299,323	11,048,673	11,733,941	12,719,840
Average Well Head Price per m^3 ($)	21.21	35.99	44.86	52.79	64.12	76.77	82.96	97.52	118.39
Reservation Sale Bonuses ($)	—	— (Last Sale Held in 1969)			—	—	40,888	820,345	611,199
Lease Sale Bonuses ($)	—	— (Last Sale Held in 1971)			—	—	897,895	1,057,530	1,074,958
Reservation and Lease Rentals & Fees ($)	14,934	15,009	11,700	10,766	10,237	10,198	49,300	133,635	191,409
Crown Reservation Area (ha)	—	—	—	—	—	—	4 736	16 915	22 291
Crown Lease Area (ha)	15 910	8 108	7 213	6 954	6 759	6 759	22 559	29 519	40 806
Total Crown Area Under Disposition (ha)	15 910	8 108	7 213	6 954	6 759	6 759	27 295	46 434	63 097
Industry Reported Total Expenditures ($)	6,000,000	12,500,000	13,900,000	14,600,000	18,900,000	27,900,000	31,000,000	38,300,000	55,200,000

Certain Petroleum Industry Figures are Estimates.

TABLE 7

1981
Oil and Water Production Summary
(cubic metres)

Field	Cum. Oil to Dec. 31/80	Oil Produced 1981	Cum. Oil to Dec. 31/81	Cum. Water to Dec. 31/80	Water Produced 1981	Cum. Water to Dec. 31/81	Producing Wells as at December 31, 1981 Capable	Actual
Daly Unit #1	876 012.2	26 630.3	902 642.5	2 206 160.1	155 838.4	2 361 998.5	38	29
Daly Unit #3	1 172 930.0	28 061.1	1 200 991.1	962 385.2	32 552.0	994 937.2	57	41
Daly Non-Unit	1 045 885.8	12 368.1	1 058 253.9	8 826 793.3	397 589.0	9 224 382.3	48	36
Ebor Unit #1	44 134.7	878.9	45 013.6	12 163.7	—	12 163.7	6	6
Ebor Non-Unit	36 673.7	865.9	37 539.6	44 849.0	663.3	45 512.3	3	3
Kirkella Field	124 445.0	3 671.9	128 116.9	903 366.0	79 535.1	982 901.1	8	8
Lulu Lake Field	31 715.7	735.9	32 451.6	127 641.9	10 380.5	138 022.4	3	3
Maples Field	123 812.3	2 487.4	126 299.7	2 286 723.5	126 324.0	2 413 047.5	8	6
North Virden Scallion Unit #1	7 652 502.7	210 855.3	7 863 358.0	8 875 353.9	680 812.7	9 556 166.6	184	171
North Virden Scallion Non-Unit	961 586.9	20 244.5	981 831.4	7 685 379.4	533 758.6	8 219 138.0	57	44
Northwest Pierson Field	18 603.3	541.0	19 144.3	53 004.3	8 116.3	61 120.6	5	3
Pierson Field	100 138.1	3 362.7	103 500.8	259 652.9	24 173.5	283 826.4	10	9
Routledge Unit #1	1 737 594.9	34 956.1	1 772 551.0	9 101 213.6	665 983.8	9 767 197.4	82	76
East Routledge Unit #1	365 639.0	13 526.2	379 165.2	970 792.6	97 054.6	1 067 847.2	20	20
Routledge Non-Unit	52 620.5	908.4	53 528.9	206 847.0	2 163.1	209 010.1	2	2
Souris-Hartney Field	116 266.5	3 213.5	119 480.0	179 540.5	14 428.4	193 968.9	8	7
Tilston Field	67 083.6	2 725.4	69 809.0	472 392.3	6 018.3	478 410.6	9	6
Virden-Roselea Unit #1	1 764 488.2	54 857.7	1 819 345.9	3 669 228.5	314 363.4	3 983 591.9	62	62
Virden-Roselea Unit #2	737 955.6	23 884.5	761 840.1	3 148 644.5	253 463.6	3 402 108.1	36	35
Virden-Roselea Unit #3	1 817 013.2	45 156.8	1 862 170.0	7 137 169.2	590 390.3	7 727 559.5	76	73
Virden-Roselea Non-Unit	1 087 590.3	15 156.9	1 102 747.2	8 686 068.1	405 395.3	9 091 463.4	38	30
Waskada Unit #1	59 678.5	2 013.7	61 692.2	16 111.8	9 350.9	25 462.7	5	3
Waskada Non-Unit	52 297.9	8 238.5	60 536.4	17 924.2	8 407.8	26 332.0	15	15
West Butler Unit #1	28 403.5	498.8	28 902.3	6 521.0	—	6 521.0	10	10
West Kirkella Field	13 336.4	5 947.4	19 283.8	36 066.7	26 713.9	62 780.6	2	2
Whitewater Unit #1	71 804.7	985.9	72 790.6	19 848.7	4 234.7	24 083.4	4	4
Woodnorth Field	148 491.9	549.1	149 041.0	391 052.4	—	391 052.4	4	4
Other Areas	242 742.2	19 373.1	262 115.3	1 063 390.8	117 498.1	1 180 888.9	53	40
	20 551 447.3	542 695.0	21 094 142.3	67 366 285.1	4 565 209.6	71 931 494.7	853	748

TABLE 8

Crude Oil Sales — Transporters Disposition
1981

Producers Disposition

Field	Production	Opening Inventory	Adjustment	Closing Inventory	Sales (m^3)	Value of Sales
Daly	67 059.5	731.0	+5.7	691.5	67 104.7	$ 7,925,100
Ebor	1 744.8	51.4		98.0	1 698.2	197,506
Kirkella	3 671.9	158.1		134.5	3 695.5	409,870
Lulu Lake	735.9	116.3		105.9	746.3	84,333
Maples	3 122.6	96.1		199.5	3 019.2	345,690
North Virden Scallion	231 664.6	1 117.6	-32.8	1 343.4	231 406.0	27,482,373
Northwest Pierson	541.0	32.1		25.2	547.9	64,303
Pierson	3 362.7	80.8	-97.8	84.4	3 261.3	377,111
Routledge	49 390.7	259.4		402.3	49 247.8	5,847,296
Souris-Hartney	3 213.5	121.5	-5.7	98.8	3 230.5	372,585
Tilston	2 725.4	106.9	+115.1	56.0	2 891.4	340,459
Virden-Roselea	139 217.4	1 267.5	-29.8	1 160.1	139 295.0	16,572,657
Waskada	10 252.2	498.1		870.8	9 879.5	1,161,781
West Butler	498.8	46.6		31.3	514.1	59,900
West Kirkella	5 983.0	114.3		182.1	5 915.2	654,295
Whitewater	985.9	69.5		15.2	1 040.2	118,940
Woodnorth	549.1	48.6		62.3	535.4	63,332
Other Areas	17 976.0	585.8	-84.9	1 467.3	17 009.6	1,977,301
	542 695.0	5 501.6	-130.2	7 028.6	541 037.8	64,054,832

Deliveries To Transporters

Sales — Production	541 037.8	
— Saskatchewan	50 025.0	
		591 062.8

Transporters Disposition

Opening Inventory (Norcen)	2 282.6	
Opening Inventory (Interprovincial Pipeline)	2 646.6	
Transporters Receipts	591 062.8	
		595 992.0

Transporters Deliveries

Manitoba:	Winnipeg	— Shell	180 402.1
Ontario:	Bronte	— BP	5 132.1
	Sarnia	— Imperial	184 526.9
	Corunna	— Shell	—
	Nanticoke	— Texaco	—
Quebec:	Montreal	— Shell	147 779.7
	Montreal	— Sunoco	2 397.7
U.S.A.:	Minnesota	— Koch	57 702.2
Closing Inventory (Norcen)			2 409.0
Closing Inventory (Interprovincial Pipeline)			16 863.4
Adjustment			(-1 221.1)
			595 992.0

TABLE 9

List of Publications and Presentations - 1981
Geological Services Branch

Publications:

Survey Staff: Mineral Resources Division, Report of Field Activities 1981.

Survey Staff: Preliminary Maps - see attached detailed listing.

Baldwin, D.A., Mineral Deposits in the Ruttan Lake, Karsakuwigamak Lake, Muskayk Lake areas; Manitoba Mineral Resources Division, Open File Report OF81-4.

Gale, G.H., Baldwin, D.A. and Koo, J., A Geological Evaluation of Precambrian Massive Suphide Deposits in Manitoba; Manitoba Mineral Resources Division, Economic Geology Report ER79-1.

Gilbert, H.P., Syme, E.C. and Zwanzig, H.V., Geology of the Metavolcanic and Volcaniclastic Metasedimentary Rocks in the Lynn Lake Area; Manitoba Mineral Resources Division, Open File Report OF80-1.

Lenton, P.G. and Corkery, M.T., The Lower Churchill River Project. (Interim Report); Manitoba Mineral Resources Division, Open File Report OF81-3.

Nielsen, E., Ringrose, S.M., Matile, G.M., Groom, H., Mihychuk, M.A. and Conley, G.G., 1981 Surficial Geological Map of Manitoba; Manitoba Mineral Resources Division, Map 81-1.

Bannatyne, B.B., 1981, "Manitoba"; *in* The Industrial Minerals of Canada: A Supplement to August 1981 issue of "Industrial Minerals".

Baragar, W.R.A.* and Scoates, R.F.J., 1981, The Circum-Superior Belt: A Proterozoic Plate Margin?; *in* A. Kröner (Editor) Precambrian Plate Tectonics, Elsevier, Amsterdam, pp. 297-330.

Dean, P.L.* and Watson, D.M., 1981, Industrial Minerals of Newfoundland and Labrador; *in* The Industrial Minerals of Canada; A Supplement to August 1981 issue of "Industrial Minerals".

Gale, G.H. and Pearce, J.A.,* 1982, Geochemical Patterns in Norwegian Greenstones; Canadian Journal of Earth Sciences, vol. 19, pp. 385-397.

Weber, W. and Loveridge, W.D.,* Geological Relationships and Rb-Sr Age Studies of the Cauchon Lake Tonalite and the Pikwitonei Turbidites in the Southwestern Superior Province, Central Manitoba; in Current Research, Part C, Geological Survey of Canada, Paper 81-1C.

Weber, W. and Schledewitz, D.C.P., Airborne radiometric anomalies caused by late-kinematic granitic rocks in the Molson Lake-Red Sucker Lake area, east-central Manitoba; in Uranium in Granites (Editor - E.T. Maurice), Geological Survey of Canada, Paper 81-23.

Publications in Press

Bannatyne, B.B. and Trueman, D.L.,* Chromite Reserves and Geology of the Bird River Sill, Manitoba; Manitoba Mineral Resources Division, Open File Report OF82-1.

Bannatyne, B.B. and Watson, D.M., Industrial Minerals of the Pembina Mountain and Interlake Area, Manitoba; Geological Association of Canada Field Trip Guidebook No. 11.

Gale, G.H., Somerville, R.C.,* Chornoby, P.J.,* Haystead, B.,* Provins, N.,* Braun, D.,* Munday, D.* and Walker, A.,* Geological Setting of the Mineral Deposits at Ruttan, Thompson, Snow Lake and Flin Flon; Geological Association of Canada Field Trip Guidebook No. 14.

Gilbert, H.P., Zwanzig, H.V., Baldwin, D.A., Chornoby, P.J.* and Olson, P.E.,* Stratigraphy of the Lynn Lake Greenstone Belt and Surface Geology at Ruttan and Fox Mine; Geological Association of Canada Field Trip Guidebook No. 2.

McCabe, H.R. and Barchyn, D., Paleozoic Stratigraphy of Southwestern Manitoba; Geological Association of Canada Field Trip Guidebook No. 10.

Nielsen, E. and Matile, G., Till Stratigraphy and Proglacial Lacustrine Deposits in the Winnipeg Area; Geological Association of Canada Field Trip Guidebook No. 1.

Nielsen, E. and Dredge, L.,* Quaternary Stratigraphy and Geomorphology of a Part of the Nelson River; Geological Association of Canada Field Trip Guidebook No. 5.

Scoates, R.F.J., Volcanic Rocks of the Fox River Belt, northeastern Manitoba; Manitoba Mineral Resources Division, Geological Report GR81-1.

Syme, E.C., Bailes, A.H., Price, D.P.* and Ziehlke, D.V.,* Flin Flon Volcanic Belt: Geology and Ore Deposits at Flin Flon and Snow Lake, Manitoba; Geological Association of Canada Field Trip Guidebook No. 6.

Presentations:

Survey Staff: Annual Meeting with Industry - Review of Field Programs 1981 - Oral Presentations and Poster Session; November 18, 1981, Winnipeg.

Survey Staff: "Careers in Geology"; School Councillors' Association of Manitoba; February 1 and 2, 1982.

Survey Staff: School Lecture Series sponsored by the Winnipeg CIM.

Fedikow, M.A.F., "Rock Geochemical Exploration for Gold Mineralization"; Geological Association of Canada, Winnipeg Section; February, 1982.

Gale, G.H., "Proterozoic Massive Suphide Deposits" at Symposium on the Proterozoic, Madison, Wisconsin; May, 1981.

Gale, G.H., "Proterozoic Massive Sulphide Deposits" at Session on "Hidden Assets of the Precambrian"; Northwest Mining Convention, Spokane, Washington; December, 1981.

Gale, G.H., "Metallogeny and Mineral Deposits of Manitoba"; CIM Local Meeting, Leaf Rapids and Thompson; February, 1982.

Gilbert, H.P., "Stratigraphic Evolution of Aphebian Supracrustal Rocks of the Lynn Lake Area, Northern Manitoba"; Lake Superior Institute 1981, East Lansing, Michigan; May, 1981.

Nielsen, E., McKillop, W.B.* and McCoy, J.,* "Age of the Hartman Marine and the Campbell Beach of Lake Agassiz, Northwestern Ontario"; Geological Association of Canada Annual Meeting, Calgary; May, 1981.

Nielsen, E., "Quaternary Geology of Manitoba and the new Surficial Geology Map"; Geology Club, University of Manitoba, Winnipeg; December, 1981.

Scoates, R.F.J., "Komatiitic flows of the Fox River Belt"; Geological Association of Canada, Winnipeg Section; October, 1981.

Theyer, P., "Gold in Manitoba"; Manitoba School Science Symposium, University of Manitoba; May, 1981.

* outside author

TABLE 10

List of Preliminary Maps - 1981

Geological Maps

1981B-1	McNeill Lake (63-0/3) ..... by P.G. Lenton	1:20 000
1981B-2	Pistol Lake (West-half) (63-0/2W) ..... by P.G. Lenton	1:20 000
1981I-1	Island Lake-Cochrane Bay ..... by K.L. Neale and W. Weber	1:20 000
1981I-2	Island Lake-Sinclair-Savage Islands ..... by K.L. Neale	1:20 000
1981L-1	Watt Lake Northeast (64C/7) ..... by H.V. Zwanzig	1:20 000
1981L-2	Trophy Lake Northeast (64C/2) ..... by H. V. Zwanzig	1:20 000
1981L-3	Suwannee Lake Northeast (64C/1) ..... by H.V. Zwanzig	1:20 000
1981T-1	Setting Lake, Northeast (63-0/1,2) ..... by K.C. Albino and J.J. Macek	1:25 000
1981T-2	Setting Lake, Southwest (63J/15) ..... by K.C. Albino and J.J. Macek	1:25 000

Surficial Geology of the South Riding Mountain Area

1981-SRM-3	Clanwilliam (62J/5) ..... by H. Groom	1:50 000

Surficial Geology of the Thompson Area

1981-TH-1	Noble Lake (East-half) (63-0/16) ..... by E. Nielsen and R. Young	1:50 000
1981-TH-2	Mystery Lake (63P/13) ..... by E. Nielsen and R. Young	1:50 000
1981-TH-3	Ospwagan Lake (East-half) (63-0/9) ..... by E. Nielsen and R. Young	1:50 000
1981-TH-4	Thompson (63P/12) ..... by E. Nielsen and R. Young	1:50 000